Appendix J

Construction Noise – Method of Assessment

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Heavy equipment such as earthmovers and graders may generate higher levels of noise than operational equipment such as exhaust fans or generators. For example, pulse driers produce a noise level of 70 decibels (dB). Diesel-powered earthmoving equipment is inherently noisy and would be used in the construction of trenches and obtaining fill material from the borrow pits in Area C south of State Route 240.

The Washington State Department of Ecology (Ecology) implements rules consistent with federal noise control legislation through Washington Administrative Code (WAC) 173-60. Maximum noise levels are defined for the zoning of the area in accordance with the environmental designation for noise abatement (EDNA). The Hanford Site is classified as a Class C EDNA on the basis of industrial activities. Unoccupied areas also are classified as Class C areas by default because they are neither Class A (residential) nor Class B (commercial). Maximum noise levels are established based on the EDNA classification of the receiving area and the source area (see Table J.1). The benchmark for industrial noise levels in the state of Washington is 70 A-weighted decibels (dBA).

Table J.1. Applicable State Noise Limitations Based on Source and Receptor EDNA Designation

Source - Hanford Site	Receptor		
	Class A Residential (dBA)	**Class B Commercial (dBA)**	**Class C Industrial (dBA)**
Class C - Day	60	65	70
Night	50	NA	NA
NA = not applicable.			

J.1 Assessment of Noise Impacts

The assessment of noise impacts relies on evaluating critical distances between sources of noise and receptors and a conservative source term that is likely to overestimate impacts.

J.1.1 Critical Distances

Because the 200 Area is isolated, no human residences are likely to be impacted due to the great distances from source to receptor. The nearest residences are farmhouses along Highway 24 on the western perimeter of the Hanford Site (10 km [6.2 mi] from the western border of the 200 West Area).

Distances exceed 10 km (6.2 mi) from Area C to these residences. The shortest distance between the western perimeter of the 200 Areas and State Route 240 is about 2 km (1.25 mi).

J.1.2 Source Term

To ensure that noise levels were not underestimated, the noise generated by a diesel locomotive engine was used as a conservative source term for heavy construction equipment. Screening estimates were based on non-A-weighted (pure total sound) adjustments and A-weighted adjustments. For this analysis, each octave band frequency from 63 to 8000 hertz (Hz) was modeled from the 132-dBA locomotive engine source term (Hanson et al. 1991). Noise propagation and attenuation were based on hemispherical spreading, molecular absorption, and anomalous excess attenuation under standard day conditions (EEI 1984). For a 132-dBA source to attenuate to 70 dB, about 43 to 70 dB must be attenuated (adsorbed or dispersed) based on frequency (see Table J.2). The distance of attenuation for this source (63 Hz and 8000 Hz), based on reduction to a 70-dBA level, ranged from 40 m to 250 m (130 ft to 820 ft).

The distance of attenuation required for achieving a reduction to 70 dB was taken from tables in EEI (1984). The maximum distance of attenuation to 70 dB was 250 m (820 ft) at 500 and 1000 Hz. Effectively, no frequency would attain a sound-pressure level greater than 70 dBA at 250 m (820 ft). The overall noise level at this distance would be dominated by these frequencies. Based on decibel addition, the A-weighted decibel level would approach 75 dB for all octave bands at 250 m (820 ft). The A-weighted decibel level would decrease to 70 dBA at 400 m (1312 ft) and to 67 dBA at 500 m (1640 ft).

Table J.2. Estimated Distances of Attenuation by Octave Band (Hertz) for a 132-dBA Diesel Locomotive (conservative surrogate for heavy construction equipment)

Hertz	Correction by frequency (dB @ 30 m)	Corrected Source Term (dB @ 30 m)	Estimated Source Term (dB)	Distance of Attenuation 45 dBA[(a)]			Distance of Attenuation 70 dBA[(b)]		
				Attenuated dB	A wt Corrected	Distance (m)	Attenuated dB	A wt Corrected	Distance (m)
63	2.7	98.7	135.7	90.7	64.7	630	65.7	39.7	40
125	5.3	101.3	138.3	93.3	77.3	1700	68.3	52.3	160
250	-6	90	127	82	73	1200	57	48	100
500	-3.3	92.7	129.7	84.7	81.7	1600	59.7	56.7	250
1000	-4.7	91.3	128.3	83.3	83.3	1300	58.3	58.3	250
2000	-9	87	124	79	80	820	54	55	160
4000	-14	82	119	74	75	410	49	50	90
8000	-22.3	73.7	112.7	67.7	66.7	223	42.7	41.7	40

(a) The value of 45 dBA is routinely associated with quiet residential areas and is 5 dB below the level commonly used for a residential night-time noise standard of 50 dBA. This provides a 5-dBA margin of safety.
(b) The noise standard for industrial zones during daylight hours is 70 dBA (WAC 173-60).

A "region of influence" for heavy equipment would be set at 500 m (1640 ft) for operations in the 200 Areas and at Area C. A 500-m (1640-ft) region of influence would allow for the simultaneous operation of two pieces of heavy equipment such that estimated noise levels would not exceed 70 dBA at 500 m.

J.2 References

EEI. 1984. "Community Noise Criteria." Chapter 2 in *Electric Power Plant Environmental Noise Guide, Volume 1*. Edison Electric Institute, Washington, D.C.

Hanson, C. E., H. J. Saurenman, and D. A. Towers. 1991. "Rail Transportation Noise and Vibration." In *Handbook of Acoustical Measurements and Noise Control.* C. M. Harris (ed.), 3rd ed., pp. 46.1–46.24, McGraw-Hill, Inc., New York.

WAC 173-60. "Maximum Environmental Noise Levels." Washington Administrative Code, Olympia, Washington. Online at:
http://www.leg.wa.gov/wac/index.cfm?fuseaction=chapterdigest&chapter=173-60